

A Comparison of Selected EIA-782 Data With Other Data Sources

by Jacob Bournazian

Introduction

The EIA-782 survey series collects data on petroleum markets to fulfill legislative mandates from Congress and to provide comprehensive information for evaluating market behavior. It includes three surveys: Form EIA-782A, “Refiners’/Gas Plant Operators’ Monthly Petroleum Product Sales Report;” Form EIA-782B, “Resellers’/Retailers’ Monthly Petroleum Product Sales Report;” and Form EIA-782C, “Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption.” This article compares the data from the EIA-782 survey series with other sources to assess the quality of the EIA-782 data. Significant differences and trends among data series may indicate the need for changes in data collection and processing, the reporting population, survey or sample design, or may simply reflect conceptual differences across surveys.

The data sources used to compare with the EIA-782 series include:

- The Bureau of Labor Statistics (BLS) Office of Consumer Price Index (CPI) data for retail prices of motor gasoline, diesel fuel, and residential No. 2 fuel oil.
- Form EIA-888, “On-Highway Diesel Fuel Price Survey,” for retail prices of diesel fuel.
- Form EIA-878, “Motor Gasoline Price Survey,” for retail prices of gasoline.
- Form EIA-821, “Annual Fuel Oil and Kerosene Sales Report,” for volumes of distillate and residual fuel oil.
- EIA’s *Petroleum Supply Annual (PSA)* product supplied for volumes of distillate fuel oil, residual fuel oil, and motor gasoline.

- Federal Highway Administration (FHWA) for volumes of motor gasoline.

This article discusses the differences among the data sources and the reasons for variation among the data series. Some differences are irreconcilable and exist among the data sources because of different reporting populations, point in time measurements of market activity, survey design, methodology, and metadata issues relating to product and energy-use sector definitions. Other factors that contribute to differences between data sources include differences in geographic and/or market coverage, product definitions, and units of measure. A more detailed description of each data source is contained in the Notes section at the end of this article.

Price Comparisons

Generally, Tables FE1 – FE3 show that EIA-782 national prices are lower than the BLS, EIA-878, and EIA-888 retail price data series. Differences in the survey methodology across the surveys explain some of the price differences.

- The BLS, EIA-878, and EIA-888 prices include all taxes whereas EIA-782 prices exclude all taxes. For this article, a U.S.-total-weighted Federal and State tax provided by the FHWA is deducted from BLS, EIA-878, and EIA-888 prices. No adjustment was made to the BLS, EIA-878, and EIA-888 prices to remove local sales taxes and other State and local taxes such as environmental discharge and clean up taxes, underground storage tank taxes, and transportation use taxes.

- BLS prices are collected from urban areas whereas EIA-782, EIA-878, and EIA-888 prices are collected from both rural and urban areas across a region or state.
- The EIA-782 uses current volumes while BLS, the EIA-878 and EIA-888 use fixed volumes to compute weighted average prices.
- The EIA-782 prices represent all sales during the month, while BLS prices represent a point in the month. The EIA-878 and the EIA-888 are weekly surveys and represent a point in time in the week. In this article, the annual EIA-878 and EIA-888 prices were calculated using simple arithmetic means.

Table FE1. U.S. Residential No. 2 Distillate Prices, 1995-2001 (Cents per Gallon)

Year	EIA-782	BLS	Percentage BLS/EIA-782
1995	86.7	89.3	1.03
1996	98.9	101.9	1.03
1997	98.4	101.4	1.03
1998	85.2	88.0	1.03
1999	87.6	90.0	1.03
2000	131.1	136.0	1.04
2001	125.0	131.0	1.05

Residential No. 2 Fuel Oil

Table FE1 shows BLS prices are 3 to 5 percent higher than EIA-782 prices from 1995 through 2001. The difference between the two series has gradually grown each year since 1999. BLS prices are obtained from urban areas only and do not reflect complete geographic coverage for this product. EIA-782 prices are volume weighted price estimates.

On-Highway Diesel Fuel

Table FE2 shows the annual estimates for EIA-782 and EIA-888 prices from 1995-2001 and for BLS prices from 1998-2001. BLS began publishing retail diesel fuel prices beginning in 1998. EIA-782 and EIA-888 prices track closely, however, the EIA-888 prices range from 9 to 23 percent below the BLS prices. No adjustment was made to the BLS and EIA-888 prices for additional State and/or local taxes relating to environmental regula-

Table FE2. U.S. Retail On-Highway Diesel Fuel Prices, 1995-2001 (Cents per Gallon)

Year	EIA-782	EIA-888	BLS	Percentage	
				EIA-888/EIA-782	BLS/EIA-782
1995	67.0	67.5	n/a	1.01	n/a
1996	78.8	80.0	n/a	1.02	n/a
1997	74.5	75.8	n/a	1.02	n/a
1998	59.3	60.2	73.2	1.02	1.23
1999	68.5	67.7	76.9	0.99	1.12
2000	103.6	104.6	113.3	1.01	1.09
2001	94.3	95.7	109.0	1.01	1.16

n/a = not available

tions and transportation use, so both price series were expected to be higher than the EIA-782 prices.

BLS prices are obtained from urban areas and do not reflect complete geographic coverage for this product. Diesel prices are one of five types of fuel prices that are collected for the motor fuels item strata in calculating the Consumer Price Index. Outlets are selected based upon responses to the BLS Telephone Point of Purchaser Survey (TPOPS) on where the consumer purchased any motor fuels during the survey period. The companies reporting on the EIA-888 survey were selected from the EIA-782 surveys.

Motor Gasoline

Table FE3 shows the annual estimates for EIA-782, EIA-878, and BLS prices from 1990-2001. The price differences were similar across each grade of gasoline so this paper only discusses the prices for regular grade gasoline. For the past 11 years, BLS prices vary between 5 and 9 percent above the EIA-782 prices. EIA-878 prices are between 1 and 5 percent higher than EIA-782 prices during the same time period. Since both BLS and EIA-878 prices contain additional taxes relating to sales taxes, highway use taxes, and other local taxes that could not be removed for this analysis, the EIA-782 prices should be lower than the other series.

Since BLS does not calculate an annual price, a simple average of monthly prices was calculated to obtain the annual average price. The BLS monthly prices are calculated based on approximately 900 price quotes. Approximately 25 to 35 prices are collected from each published geographic area. EIA-782 prices represent

Table FE3. U.S. Retail Motor Gasoline Prices, Regular Grade, 1990-2001 (Cents per Gallon)

Year	EIA-782	EIA-878	BLS	Percentage	
				EIA-878/ EIA-782	BLS/ EIA-782
1990	87.2	n/a	86.9	n/a	1.00
1991	78.1	78.1	82.3	1.00	1.05
1992	75.2	76.2	80.2	1.01	1.07
1993	71.7	73.9	78.0	1.03	1.09
1994	69.4	70.1	73.9	1.01	1.06
1995	72.5	73.7	77.3	1.02	1.07
1996	81.2	85.0	85.7	1.05	1.06
1997	80.0	82.0	85.5	1.03	1.07
1998	62.5	64.4	67.4	1.03	1.08
1999	73.0	75.2	78.2	1.03	1.07
2000	106.6	109.6	112.2	1.03	1.05
2001	99.6	103.2	107.3	1.04	1.08

n/a = not available

sales transactions in all 50 States. There are other limitations in comparing a simple average data series with a volume weighted average price series because of the effect of volume changes throughout the year on the annual price estimate.

The EIA-878 also uses fixed volume weights for calculating prices based on approximately 900 price quotes each week. A simple average of weekly prices was calculated to obtain the annual average price. At the national level, EIA-878 regional prices are weighted based on fixed weights for each region. The EIA-878 sample used from 1998 through 2001 is based on EIA-782 sales volumes from October 1996 through October 1997. The EIA-782 prices utilize all sales transactions throughout the reference month whereas the EIA-878 are point in time estimates.

Volume Comparisons

EIA-782C volumes were compared with volumes reported in the EIA-821, the PSA, and the FHWA. Product supplied in the PSA is an estimate of the demand for petroleum products because it measures the production and adjustments from primary sources of supply for a given time period. It is calculated by adding and

subtracting volumes as they are moved into and out of the primary distribution stream. Sales volume data from the EIA-782C and EIA-821 reflect the transfer of product title from a seller to a buyer into those States where the products are locally marketed and consumed. FHWA doesn't collect actual sales data on gasoline and diesel fuel. States report their fuel volumes to FHWA based on the beginning inventory at the terminal facility minus exports plus shipments to the terminal during the reporting cycle. This difference in survey concepts and methodology underlies some of the differences that exist between the data series.

Distillate Fuel Oil

Table FE4 shows volumes of distillate fuel oil from the EIA-782C, EIA-821, and PSA series from 1990 through 2001. From 1990 through 1992, the EIA-782C volumes are higher than the EIA-821 and PSA volumes. The difference between the EIA-782C series and the PSA series narrows after 1993. An important reason for this change is the addition in 1993 of several importers and traders to the exclusionary list used by respondents when reporting sales on the EIA-782C. For a description of the changes made in 1993 see [Changes to Form EIA-782C, "Monthly Report of Petroleum Products Sold into States for Consumption,"](#) by Kenneth I. Platto, *Petroleum Marketing Monthly*, May 1993. Respondents to the EIA-782C should exclude sales to any company on the exclusionary list that is not a local distributor, local retailer, or end user. These changes im-

Table FE4. U.S. Distillate Fuel Oil Volumes, 1990-2001 (Million Gallons)

Year	EIA-782C	EIA-821	PSA	Percentage	
				EIA-821/ EIA-782C	PSA/ EIA-782C
1990	50513	47827	46305	0.95	0.92
1991	48892	45211	44775	0.92	0.92
1992	49971	47262	45791	0.95	0.92
1993	48029	48290	46622	1.01	0.97
1994	49188	50424	48477	1.03	0.99
1995	49332	51469	49158	1.04	1.00
1996	51895	53379	51731	1.03	1.00
1997	51903	54366	52665	1.05	1.01
1998	52371	55306	53064	1.06	1.01
1999	54614	57573	54759	1.05	1.00
2000	55822	59601	57217	1.07	1.02
2001	57344	60451	58971	1.05	1.03

prove the EIA-782C's market coverage and eliminate double counting of volumes sold.

Since 1997, EIA-782C volumes have been below both EIA-821 volumes and PSA volumes. This suggests that the EIA-782C may still not have complete coverage on distillate sales. Table FE4 also shows that the difference between the EIA-782C and EIA-821 volumes is greater than the difference between the EIA-782C and the PSA volumes.

One possible source for the widening gap between EIA-821 and EIA-782C volumes is the sales coverage for on-highway use. The EIA-821 on-highway energy use sector shows an increase of approximately 16 percent since 1997 and is the largest component contributing to the increase in distillate volumes for that survey during the past 5 years. The EIA-821 volumes for on-highway use are obtained from the Federal Highway Administration and used in place of data reported for this category. However, some EIA-821 respondents may report sales to commercial and institutional fleet vehicles in the commercial use category. If the commercial category contains some misreported transportation volumes, and exogenous data is used to replace the data for on-highway use, then some double counting of distillate volumes for transportation use on the EIA-821 may occur. If sales to fleet vehicles, which are reported in the commercial category, are increasing at approximately the same rate as other distillate sales for other on-highway use, then the amount of double counting of distillate sales in the EIA-821 survey may also be increasing over the past five years, and may contribute to any differences between the EIA-782C and EIA-821 data series.

Motor Gasoline

Table FE5 shows volumes of motor gasoline from the EIA-782C, FHWA and PSA series from 1990 through 2001.

EIA-782C and PSA

Table FE5 shows that during 1990-1992 PSA motor gasoline volumes are between 8 – 10 percent lower than the EIA-782C volumes. One reason PSA volumes are significantly lower than EIA-782C volumes prior to 1993 is that double counting occurred on the EIA-782C because some respondents were not excluding sales to companies that should have listed on the exclusionary list. A second reason EIA-782C volumes are greater than PSA volumes prior to 1993 was that PSA did not

Table FE5. U.S. Motor Gasoline Volumes, 1990-2001 (Million Gallons)

Year	EIA-782C	PSA	FHWA	Percentage	
				PSA/EIA-782C	FHWA/EIA-782C
1990	122574	110913	115275	0.90	0.94
1991	120524	110192	113196	0.91	0.94
1992	120737	111418	114854	0.92	0.95
1993	117886	114607	116614	0.97	0.99
1994	120151	116523	118531	0.97	0.99
1995	122582	119405	120876	0.97	0.99
1996	124243	120969	123327	0.97	0.99
1997	125632	122901	125045	0.98	1.00
1998	128696	126518	128504	0.98	1.00
1999	131066	129247	132261	0.99	1.01
2000	129527	129876	132280	1.00	1.02
2001	132029	131992	n/a	1.00	n/a

n/a = not available

have complete coverage of downstream blending of finished motor gasoline. Blending of fuel ethanol, methanol, methyl tertiary butyl ether (MTBE), and other blend stock with gasoline often occurs downstream from the refineries. Prior to 1993, this is included in the EIA-782C volumes but not in the PSA volumes. Since 1993, the published PSA motor gasoline volumes include downstream blending at bulk terminals. As a result, the difference between the EIA-782C and the PSA volumes narrows after 1993.

EIA-782C and FHWA

Table FE5 also shows that EIA-782C volumes generally track the FHWA motor gasoline volumes beginning in 1993. Prior to 1993, FHWA volumes were reported by wholesale distributors to State motor fuel tax agencies that compile data on gasoline taxes and these data were reported by the State agencies to FHWA. In 1993, the point of Federal tax collection was moved upstream from the last wholesale sale to the terminal operators. This change in the reporting volumes results in more accurate reporting of the FHWA volumes.

Residual Fuel Oil

Table FE6 shows volumes of residual fuel oil from the EIA-782C, EIA-821, and PSA from 1990 through 2001.

EIA-782C vs. PSA and EIA-821

Table FE6 shows that the difference between the EIA-782C and the other two series widen after 1993 and reach its highest level in 2000 with PSA volumes exceeding the EIA-782C volumes by 43 percent and the EIA-821 exceeding the EIA-782C volumes by 35 percent. The large and continuous divergence between the EIA-782C and the other two series suggests that the EIA-782C may be missing some coverage of residual fuel oil sales. In addition, there may have been some misreporting by respondents in the PSA surveys during this time period.

Table FE6. U.S. Residual Fuel Oil Volumes, 1990-2001 (Million Gallons)

Year	EIA-782C	EIA-821	PSA	Percentage	
				EIA-821/ EIA-782C	PSA/ EIA-782C
1990	18677	19233	18838	1.03	1.01
1991	17856	17632	17750	0.99	0.99
1992	16317	16199	16822	0.99	1.03
1993	13555	15064	16559	1.11	1.22
1994	12753	14825	15649	1.16	1.23
1995	9623	12318	13058	1.28	1.36
1996	10639	13257	13041	1.25	1.23
1997	10583	12504	12213	1.18	1.15
1998	11513	14730	13600	1.28	1.18
1999	10259	13328	12726	1.30	1.24
2000	9760	13211	13966	1.35	1.43
2001	10285	13546	12435	1.32	1.21

During 1999 through 2001, some importers misreported their imports of residual fuel oil on the EIA-814, "Monthly Imports Report." Their imports of unfinished oils were combined with residual fuels and both products were reported as residual fuel oil. This may be due to the misconception by respondents that imports reported to EIA should match the same import volumes reported to the U.S. Customs office. When a shipment reaches the United States, the importer of record will complete Customs Form 7501, "Entry Summary" (CF-7501). CF-7501 is used to validate data reported on Form EIA-814. CF-7501 does not have a category for unfinished oils so imports of unfinished oils are mistakenly reported as residual fuel oil. It is unclear how long the reporting of unfinished oils as residual fuel oil has been occurring during the past 10 years. The reported imports of unfinished oil as residual fuel oil by some PSA respondents contributes to the higher PSA volumes for residual fuel oil. This is notable in the

past 2 years as imports of residual fuel oil reached their highest levels and account for 39 percent of product supplied for residual fuel oil in 2000 and 47 percent in 2001. A data correction for 2001 PSA residual fuel oil volumes moved some volumes from imports of residual fuel oil to imports of unfinished oils. This resulted in reducing the gap between the EIA-782C and PSA residual fuel volumes. No other data corrections were made to the 1999 and 2000 PSA volumes.

Another reason EIA-782C volumes are below the other series is that some firms may be missing from the reporting population of the EIA-782C survey. Missing firms from the EIA-782C will undercount sales and contribute to the difference between the series as the percentage of imports that comprise product supplied of residual fuel oil increases. The EIA-782C has been below both other data series for the past nine years and the gradual widening of this disparity, even after the revision of the 2001 PSA volumes, indicates that the EIA-782C is missing some coverage of residual fuel oil.

Summary

One method of evaluating the quality of petroleum market prices and volumes is to compare EIA-782 series data with other sources. Differences among data sources could lead to a review and possible update of the reporting populations for the EIA-782 surveys and research on alternatives for adjusting data. Other differences across data sources indicate differences in survey methodology and conceptual differences with data collection.

Notes

Data Sources

The Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report," collects monthly price and volume data at the State level for 14 petroleum products for various retail and wholesale marketing categories. It is a census of refiners and gas plant operators. The frame is updated on an ongoing basis using respondent lists from surveys such as the Form EIA-810, "Monthly Refinery Report;" the Form EIA-816, "Monthly Natural Gas Liquids Report;" and

industry trade publications. Currently, 110 companies respond to the EIA-782A survey.

The Form EIA-782B, "Resellers'/Retailers' Monthly Petroleum Product Sales Report," is sent to a sample of resellers and retailers of motor gasoline, distillate, propane, and residual fuel oil. Respondents to Form EIA-863, "Petroleum Product Sales Identification Survey," are used as the sampling frame of resellers and retailers for the EIA-782B. Firms having 5 percent or more of sales in a State are selected with certainty. The remaining companies on the frame are sampled by geographic area, product, type of sale, and by probability proportional to size. The EIA-782B sample includes approximately 2,000 companies.

The Form EIA-782C, "Monthly Report of Prime Supplier Sales of Petroleum Products Sold for Local Consumption," collects volumes of prime supplier sales of selected petroleum products into States where they are locally sold and consumed. A prime supplier is a firm that produces, imports, or transports any of the selected petroleum products across State boundaries and local marketing areas and sells the product to local distributors, local retailers, or end users. This survey provides a measure of consumption in most States. Currently, 183 firms respond to the EIA-782C survey.

Data collected on the Forms EIA-782A, EIA-782B, and EIA-782C are published in the *Petroleum Marketing Monthly* (PMM) and the *Petroleum Marketing Annual* (PMA).

In addition, production, import, and export data collected by EIA's Petroleum Division are published in the *Petroleum Supply Monthly* (PSM) and the *Petroleum Supply Annual* (PSA). The Petroleum Division uses the Petroleum Supply Reporting System (PSRS) for data collection. The PSRS is composed of a family of data collection survey forms, data processing systems, and publications systems. Detailed data on refinery and natural gas plant operations, bulk terminal and pipeline stocks, petroleum products imports, and movements of petroleum products among Petroleum Administration for Defense (PAD) districts are collected monthly. Figures for product supply originate from Forms EIA-810, "Monthly Refinery Report;" EIA-811, "Monthly Bulk Terminal Report;" EIA-812, "Monthly Product Pipeline Report;" EIA-813, "Monthly Crude Oil Report;" EIA-814, "Monthly Imports Report;" EIA-816, "Monthly Natural Gas Liquids Report;" and EIA-817, "Monthly Tanker and Barge Movement Report." Aggregate export data obtained from the Bureau of the Census are also included in

computations for the PSM and PSA. The PMA and the PSA may contain revisions of the data published in the PMM and the PSM, respectively, due to late submissions or revisions to the monthly data.

The Form EIA-821, "Annual Fuel Oil and Kerosene Sales Report," collects data on the sales to end users of distillate fuel oil, residual fuel oil, and kerosene. The data are used to determine the level of sales by energy-use category and product at the State, regional, and national levels. The sample size is approximately 4,000. The sampling frame for the EIA-821 is also derived from the respondents to Form EIA-863. The EIA-863 is a quadrennial census used to collect information on size, type, and geographic location of firms selling petroleum products. Data from the Federal Highway Administration (FHWA) of the U.S. Department of Transportation replace EIA-821 data reported as on-highway diesel sales.

The Highway Statistics Division of the FHWA collects information related to highway transportation. Sales volumes of motor gasoline are published on a calendar year basis and are a cumulative tabulation of gross gallons of gasoline reported by wholesale distributors to State motor fuel tax agencies. The FHWA collects information on finished motor gasoline, with no distinction made among motor gasoline grades. The data include gasoline for both highway and non-highway use. The FHWA includes gasohol but excludes exports, fuels for military use, and dealer transfers.

The Bureau of Labor Statistics (BLS) publishes the aggregate index for household fuels and its component indexes for electricity and natural gas, as well as the motor fuels. The component index for fuel oil and diesel fuel are only published at the national level. These retail prices are collected monthly by BLS representatives in the urban areas, and support the estimation of the Consumer Price Index (CPI). The CPI uses fixed volume weights to measure the change in price over time for a defined market basket of goods and services bought by urban consumers. It measures the percent change in consumers' expenditures on a fixed list of items whose values and qualities do not change over time. The base period weight of the fuels indexes for the time period evaluated represents the out-of-pocket expenditures on household fuels as reported in the Consumer Expenditure Survey (1993-1995). Approximately 2,400 prices are collected for all three grades of gasoline in approximately 87 urban areas across the country and include all taxes directly associated with the purchase and the use of the items. The 87 areas cover 39 States and the District of Columbia.